mitochondrial membrane protein-associated neurodegeneration

Mitochondrial membrane protein-associated neurodegeneration (MPAN) is a disorder of the nervous system. The condition typically begins in childhood or early adulthood and worsens (progresses) over time.

MPAN commonly begins with difficulty walking. As the condition progresses, affected individuals usually develop other movement problems, including muscle stiffness (spasticity) and involuntary muscle cramping (dystonia). Many people with MPAN have a pattern of movement abnormalities known as parkinsonism. These abnormalities include unusually slow movement (bradykinesia), muscle rigidity, involuntary trembling (tremors), and an inability to hold the body upright and balanced (postural instability).

Other neurological problems that occur in individuals with MPAN include degeneration of the nerve cells that carry visual information from the eyes to the brain (optic atrophy), which can impair vision; problems with speech (dysarthria); difficulty swallowing (dysphagia); and, in later stages of the condition, an inability to control the bowels or the flow of urine (incontinence). Additionally, affected individuals may experience a loss of intellectual function (dementia) and psychiatric symptoms such as behavioral problems, mood swings, hyperactivity, and depression.

MPAN is characterized by an abnormal buildup of iron in certain regions of the brain. Because of these deposits, MPAN is considered part of a group of conditions known as neurodegeneration with brain iron accumulation (NBIA).

Frequency

MPAN is a rare condition that is estimated to affect less than 1 in 1 million people.

Genetic Changes

Mutations in the *C19orf12* gene cause MPAN. The protein produced from this gene is found in the membrane of cellular structures called mitochondria, which are the energy-producing centers of the cell. Although its function is unknown, researchers suggest that the C19orf12 protein plays a role in the maintenance of fat (lipid) molecules, a process known as lipid homeostasis.

The gene mutations that cause this condition lead to an altered C19orf12 protein that likely has little or no function. It is unclear how these genetic changes lead to the neurological problems associated with MPAN. Researchers are working to determine whether there is a link between problems with lipid homeostasis and brain

iron accumulation and how these abnormalities might contribute to the features of this disorder.

Inheritance Pattern

This condition is inherited in an autosomal recessive pattern, which means both copies of the gene in each cell have mutations. The parents of an individual with an autosomal recessive condition each carry one copy of the mutated gene, but they typically do not show signs and symptoms of the condition.

Other Names for This Condition

- mitochondrial membrane protein-associated neurodegeneration due to C19orf12 mutation
- mitochondrial protein-associated neurodegeneration
- MPAN
- NBIA4
- neurodegeneration with brain iron accumulation 4

Diagnosis & Management

Genetic Testing

- Genetic Testing Registry: Neurodegeneration with brain iron accumulation 4 https://www.ncbi.nlm.nih.gov/gtr/conditions/C3280371/

Other Diagnosis and Management Resources

- GeneReview: Mitochondrial Membrane Protein-Associated Neurodegeneration https://www.ncbi.nlm.nih.gov/books/NBK185329
- GeneReview: Neurodegeneration with Brain Iron Accumulation Disorders Overview https://www.ncbi.nlm.nih.gov/books/NBK121988
- Spastic Paraplegia Foundation: Treatments and Therapies http://sp-foundation.org/understanding-pls-hsp/treatments.html

General Information from MedlinePlus

- Diagnostic Tests https://medlineplus.gov/diagnostictests.html
- Drug Therapy https://medlineplus.gov/drugtherapy.html
- Genetic Counseling https://medlineplus.gov/geneticcounseling.html

- Palliative Care
  https://medlineplus.gov/palliativecare.html
- Surgery and Rehabilitation
  https://medlineplus.gov/surgeryandrehabilitation.html

Additional Information & Resources

MedlinePlus

- Encyclopedia: Dementia
  https://medlineplus.gov/ency/article/000739.htm
- Health Topic: Degenerative Nerve Diseases
  https://medlineplus.gov/degenerativenervediseases.html
- Health Topic: Mitochondrial Diseases
  https://medlineplus.gov/mitochondrialdiseases.html
- Health Topic: Movement Disorders
  https://medlineplus.gov/movementdisorders.html

Genetic and Rare Diseases Information Center

- Mitochondrial Membrane Protein-Associated Neurodegeneration
  https://rarediseases.info.nih.gov/diseases/12569/mitochondrial-membrane-protein-associated-neurodegeneration

Additional NIH Resources

- National Institute of Neurological Disorders and Stroke: Dystonias Fact Sheet
  https://www.ninds.nih.gov/Disorders/All-Disorders/Dystonias-Information-Page

Educational Resources

- Disease InfoSearch: Neurodegeneration with brain iron accumulation 4
  http://www.diseaseinfosearch.org/Neurodegeneration+with+brain+iron+accumulation+4/8998
- MalaCards: mitochondrial membrane protein-associated neurodegeneration
  http://www.malacards.org/card/mitochondrial_membrane_protein_associated_neurodegeneration
- Merck Manual for Healthcare Professionals: Parkinsonism
  http://www.merckmanuals.com/home/brain-spinal-cord-and-nerve-disorders/movement-disorders/parkinsonism
- NBIA Disorders Association: MPAN
  http://nbiadisorders.org/about-nbia/mpan

- NBIACure: MPAN
  http://nbiacure.org/learn/nbia-disorders/mpan/
- Orphanet: Mitochondrial membrane protein-associated neurodegeneration
  http://www.orpha.net/consor/cgi-bin/OC_Exp.php?Lng=EN&Expert=289560

Patient Support and Advocacy Resources

- NBIA Disorders Association
  http://nbiadisorders.org/
- NBIACure
  http://nbiacure.org/

GeneReviews

- Mitochondrial Membrane Protein-Associated Neurodegeneration
  https://www.ncbi.nlm.nih.gov/books/NBK185329
- Neurodegeneration with Brain Iron Accumulation Disorders Overview
  https://www.ncbi.nlm.nih.gov/books/NBK121988

Scientific Articles on PubMed

- PubMed
  https://www.ncbi.nlm.nih.gov/pubmed?term=%28%28mitochondrial+membrane+protein-associated+neurodegeneration%5BTIAB%5D%29+OR+%28nbia4%5BTIAB%5D%29+OR+%28mitochondrial+membrane+protein+associated+neurodegeneration%5BTIAB%5D%29%29+AND+english%5Bla%5D+AND+human%5Bmh%5D+AND+%22last+3600+days%22%5Bdp%5D

OMIM

- NEURODEGENERATION WITH BRAIN IRON ACCUMULATION 4
  http://omim.org/entry/614298

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